

Grades 3–5: Data Analysis and Probability

STANDARD	I.	Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.		
		A.	Design investigations to address a question and consider how data-collection methods affect the nature of the data set.	
EXPECTATION	3	4	5	5
	1. Write questions about objects and events that can be investigated by collecting data.	1. Develop strategies for administering a simple survey to obtain unbiased results.	1. Compare data sets collected in different ways to address a given question and then determine how the methods of collection affected the data sets.	
EXPECTATION	B.	Collect data using observations, surveys, and experiments.	4	5
	1. Collect data using observations.	1. Systematically collect data using surveys.	1. Collect data using observations, surveys, and experiments.	
EXPECTATION	C.	Represent data using tables and graphs such as line plots, bar graphs, and line graphs.	4	5
	*1. Construct line (dot) plots for data sets.	*1. Construct bar graphs for collected data sets with scale increments of one or greater.	1. Determine appropriate horizontal and vertical scales for data sets and then how to represent zero on a graph.	
	*2. Read and interpret information from tables, pictographs, bar graphs, and line (dot) plots.	*2. Read and interpret information from tables, line graphs, and bar graphs.	*2. Construct and interpret tables and line graphs for data sets from applied situations. 3. Explain what type of graph may be appropriate for a given data set.	

EXPECTATION**D.** Recognize the differences in representing categorical and numerical data.

	3	4	5
1. Define and give examples of categorical data.	1. Describe types of graphs that may be used to represent categorical data.	*1. Compare the types of graphs that may be used for categorical data with the types that may be used for numerical data.	
	2. Describe types of graphs that may be used to represent numerical data.		

STANDARD **II.** Select and use appropriate statistical methods to analyze data.**EXPECTATION****A.** Describe the shape and important features of a set of data and compare related data sets, with an emphasis on how the data are distributed.

	3	4	5
1. Describe the shape of a line (dot) plot or bar graph of a numerical data set (i.e., where the data are concentrated, values for which there are no data, the range, and data points with unusual values).	1. Compare the shapes of graphs of two different numerical data sets that address the same question for different populations.	*1. Describe the features of a data set, including measures of center, range, and outliers.	

EXPECTATION**B.** Use measures of center, focusing on the median, and understand what each does and does not indicate about the data set.

	3	4	5
*1. Find the median and mode of a data set and explain what each indicates about the data set.	1. Use the mode to describe a set of categorical data.	*1. Find the mean, median, and mode of a numerical data set and explain what each indicates about the data set.	

EXPECTATION	C. Compare different representations of the same data and evaluate how well each representation shows important aspects of the data.	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center; background-color: #cccccc;">3</th><th style="text-align: center; background-color: #cccccc;">4</th><th style="text-align: center; background-color: #cccccc;">5</th></tr> </thead> <tbody> <tr> <td>1. Compare the tabular, line (dot) plot, and bar graph representations of a given data set and explain the benefits of each.</td><td>1. Compare the line graph and bar graph representations of a given data set and explain the benefits of each.</td><td>*1. Compare the different types of graphs (bar graph, line [dot] plot, line graph and pictograph) to represent a given data set and explain the benefits of each.</td></tr> </tbody> </table>	3	4	5	1. Compare the tabular, line (dot) plot, and bar graph representations of a given data set and explain the benefits of each.	1. Compare the line graph and bar graph representations of a given data set and explain the benefits of each.	*1. Compare the different types of graphs (bar graph, line [dot] plot, line graph and pictograph) to represent a given data set and explain the benefits of each.					
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STANDARD	III. Develop and evaluate inferences and predictions that are based on data.	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 100px; vertical-align: top;">EXPECTATION</td><td style="width: 100px; vertical-align: top;">A. Propose and justify conclusions and predictions that are based on data and design studies to further investigate the conclusions or predictions.</td><td style="width: 100px;"></td></tr> <tr> <td style="width: 100px; vertical-align: top;"> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center; background-color: #cccccc;">3</th><th style="text-align: center; background-color: #cccccc;">4</th><th style="text-align: center; background-color: #cccccc;">5</th></tr> </thead> <tbody> <tr> <td>1. Use line (dot) plots and bar graphs to make conjectures about populations based on data sets.</td><td>*1. Use line graphs to make conjectures about populations based on data sets.</td><td>1. Make and justify predictions based on data from a variety of applied situations. 2. Consider alternative explanations to the conjectures formed on the basis of presentations of data and then design further studies to test the conjectures.</td></tr> </tbody> </table> </td><td style="width: 100px;"></td></tr> </table>	EXPECTATION	A. Propose and justify conclusions and predictions that are based on data and design studies to further investigate the conclusions or predictions.		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center; background-color: #cccccc;">3</th><th style="text-align: center; background-color: #cccccc;">4</th><th style="text-align: center; background-color: #cccccc;">5</th></tr> </thead> <tbody> <tr> <td>1. Use line (dot) plots and bar graphs to make conjectures about populations based on data sets.</td><td>*1. Use line graphs to make conjectures about populations based on data sets.</td><td>1. Make and justify predictions based on data from a variety of applied situations. 2. Consider alternative explanations to the conjectures formed on the basis of presentations of data and then design further studies to test the conjectures.</td></tr> </tbody> </table>	3	4	5	1. Use line (dot) plots and bar graphs to make conjectures about populations based on data sets.	*1. Use line graphs to make conjectures about populations based on data sets.	1. Make and justify predictions based on data from a variety of applied situations. 2. Consider alternative explanations to the conjectures formed on the basis of presentations of data and then design further studies to test the conjectures.	
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STANDARD**IV. Understand and apply basic concepts of probability.****EXPECTATION**

A. Describe events as likely or unlikely and discuss the degree of likelihood using such words as *certain, equally likely, and impossible*.

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*1. Identify common events as likely, unlikely, certain, or impossible.	1. Record the outcomes of a multiple-stage event (e.g., tossing two coins), explain the method used, and determine whether the outcomes are equally likely.	

EXPECTATION

B. Predict the probability of outcomes of simple experiments and test the predictions.

3	4	5
*1. Record the possible outcomes for a simple event (e.g., tossing a coin) and systematically keep track of the outcomes when the event is repeated many times.	1. Using models, determine the probability of a given simple event. 2. Construct tree diagrams to list the possible outcomes for multiple-stage events (e.g., tossing two coins).	*1. Determine the probability of a simple single-stage and a two-stage event. 2. Create a problem statement involving probability based on information from a given problem situation. (Students will not be required to solve the problem created.)

EXPECTATION C. Understand that the measure of the likelihood of an event can be represented by a number from 0 to 1.

3	4	5
	*1. Give examples of events for which the probability is a fraction between 0 and 1 inclusive and explain.	1. Understand when the probability of an event is 0 or 1 and give examples in each case.
		2. Explain why the sum of the probabilities of the outcomes of an experiment must equal 1.